THERMOPHYSICAL PROPERTIES OF LIQUIDS AND GASES (DATABASE)

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The database developed by the authors includes more than 2000 tables of thermophysical properties of different gases and liquids. These tables have been obtained by means of analysis and generalization of more than 470 original literature sources. The basis of the database developed by the authors is N.B. Vargaftik, Yu.K. Vinogradov and V.S. Yargin "Handbook of Physical Properties of Liquids and Gases" published in 1996 (by Begel House Inc. USA).

The book comprises a great and relatively new experimental material on thermophysical properties of liquid and gases. In comparison with the previous issues it includes the following new sections:

- thermophysical properties of a number of substances in ionized states;
- thermodynamic and transfer properties in a critical field for a large group substances;
- new tables of thermodynamic alkali metal and mercury properties;
- thermophysical data of a number of substances such as deuterium and other hydrogen isotopes.

HPLG (Handbook of Physical Properties of Liquids and Gases) relational database employs Visual FoxPro for Windows 98 providing full integration into Microsoft applied software family and quick search of the information a user is concerned about. The service programs of operational search as well as sampling selection arrangement by a single or several criteria from table data are executed by Visual FoxPro 5.0 and SQL language.

HPLG database enables:

- to make a search of thermophysical properties of different substances by both groups of substances (Fig.1) and particular properties;
- to look through a selected table or smoothly move along the table represented on the monitor screen, as well as to show references to the sources used while constructing data tables on the screen;
- to make the data selection from tables by a single or several criteria and give the results in the form of individual tables and graphs;
- to represent table data in different system units;
- perform table value interpolation, replace and modify the initial tables.

Since tables of thermophysical properties are usually represented by the authors for round temperature and pressure values, which is not always suitable for the users, a service program of table value interpolation has been developed (Fig.2). It provides two-argument interpolation: temperature and pressure and allows to estimate an interpolation error by residual interpolation polynomial term value. The interpolation error may prove to be substantial in the field of a dramatic change of thermophysical properties, e.g., in the field of phase transfer or critical area.

The database also employs a thermophysical property table value representation service in different system units. By using the Units Menu a user can select thermophysical property measurement units of a substance desired (Fig.3).
Every particular group of substances has a description involving information of general table construction features and principles, different equations and coefficient values of these equations, different graphs and table value errors, where it is possible (Fig.4).
A user can look up the references to literature sources with a possibility of sequential examination of all the references or sampling selection arrangement criteria (authors, a journal title, a paper title). Depending on which Window the Reference Button is located in you can see either the whole list of references or only those referring to this particular substances or the substance selected (Fig.5).

References

N.B. Vargaftik, Yu.K. Vinogradov, V.S. Yargin. Handbook of Physical Properties of Liquids and Gases. Begel House, Inc. New York, Wallingford (UK) 1996

Figure captions

Fig.1. Groups of substances represented in HPLG database.

Fig.2. Table interpolation result of thermal conductivity of normal hydrogen and parahydrogen for temperature T=66.28 K and interpolation error (%).

Fig.3. Thermal conductivity table of normal hydrogen and parahydrogen. Temperature is in C^o , thermal conductivity in mcal/(m.K.).

Fig.4. Description window gives a table and a table value error graph of dynamic viscosity of normal hydrogen.

Fig.5. Reference window represents a reference search result of Vargaftik and Vasilevskaya's paper.

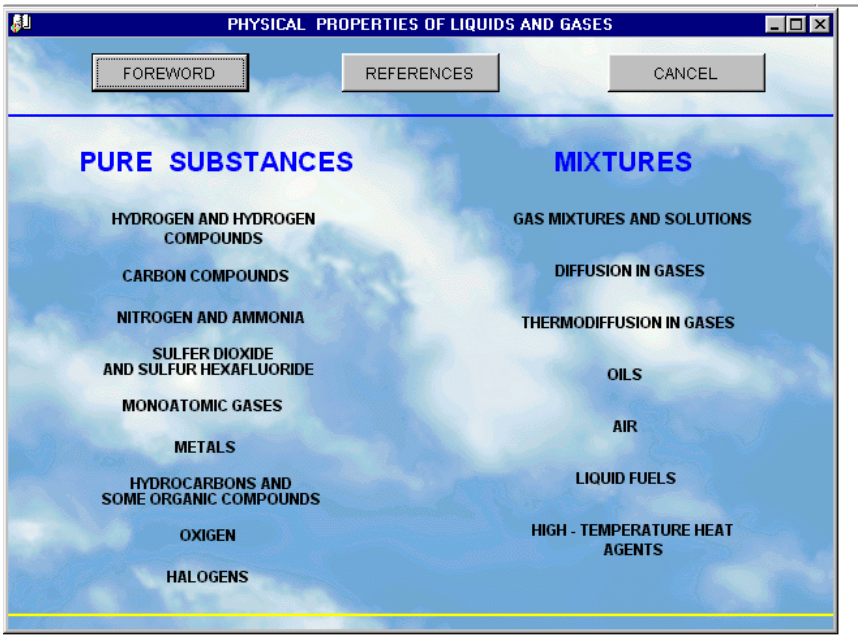

PHYSICAL PROPERTIES OF LIQUIDS AND GASES
FOREWORD
REFERENCES
CANCEL
PURE SUBSTANCES
HYDROGEN AND HYDROGEN COMPOUNDS
CARBON COMPOUNDS
NITROGEN AND AMMONIA
SULFER DIOXIDE AND SULFUR HEXAFLUORIDE
MONOATOMIC GASES
METALS
HYDROCARBONS AND SOME ORGANIC COMPOUNDS
OXIGEN
HALOGENS
MIXTURES
GAS MIXTURES AND SOLUTIONS
DIFFUSION IN GASES
THERMODIFFUSION IN GASES
OILS
AIR
LIQUID FUELS
HIGH - TEMPERATURE HEAT AGENTS

Fig.1

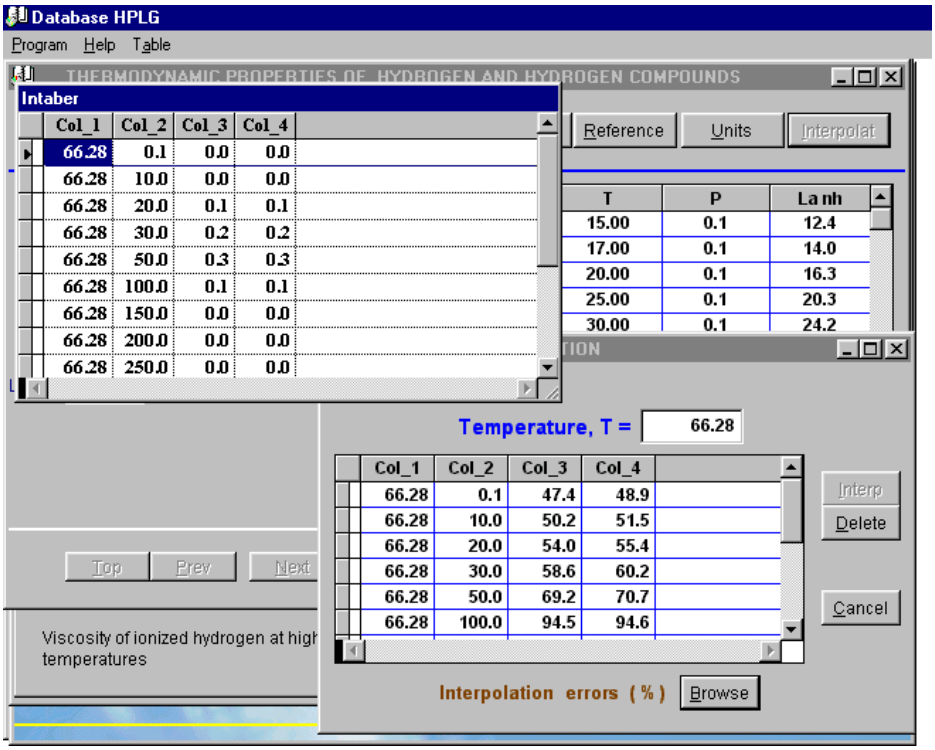

Database HPLG
Program Help Table
THERMODYNAMIC PROPERTIES OF HYDROGEN AND HYDROGEN COMPOUNDS
Intaber
Col_1 Col_2 Col_3 Col_4
66.28 0.1 0.0 0.0
66.28 10.0 0.0 0.0
66.28 20.0 0.1 0.1
66.28 30.0 0.2 0.2
66.28 50.0 0.3 0.3
66.28 100.0 0.1 0.1
66.28 150.0 0.0 0.0
66.28 200.0 0.0 0.0
66.28 250.0 0.0 0.0
Reference
Units
Interpolat
T P La nh
15.00 0.1 12.4
17.00 0.1 14.0
20.00 0.1 16.3
25.00 0.1 20.3
30.00 0.1 24.2
Temperature, T = 66.28
Col_1 Col_2 Col_3 Col_4
66.28 0.1 47.4 48.9
66.28 10.0 50.2 51.5
66.28 20.0 54.0 55.4
66.28 30.0 58.6 60.2
66.28 50.0 69.2 70.7
66.28 100.0 94.5 94.6
Interp
Delete
Cancel
Top
Prev
Next
Viscosity of ionized hydrogen at high temperatures
Interpolation errors (%)
Browse

Fig.2

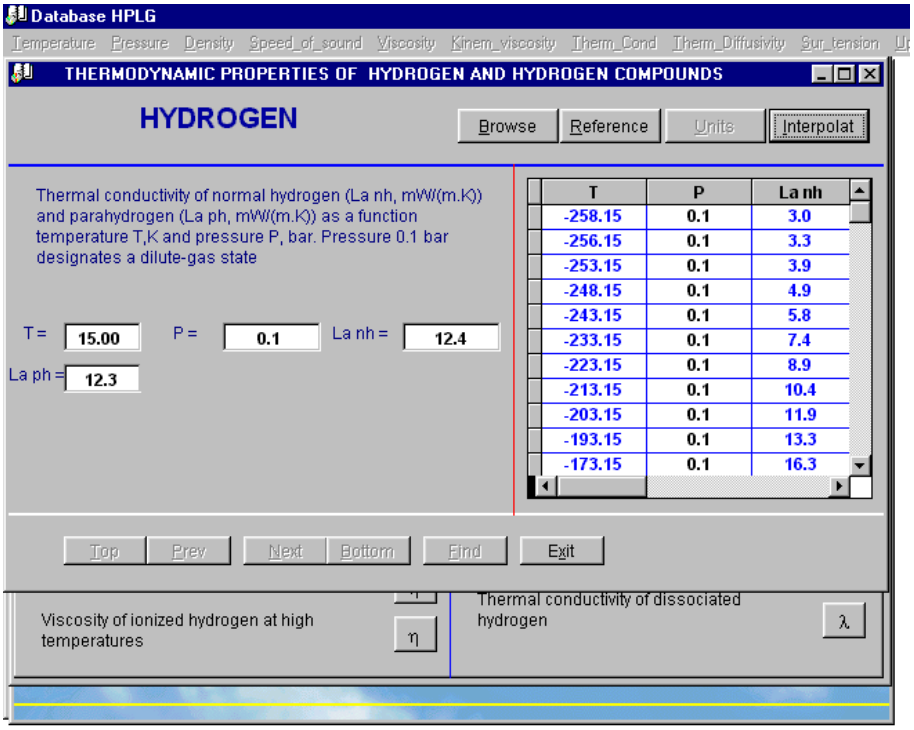
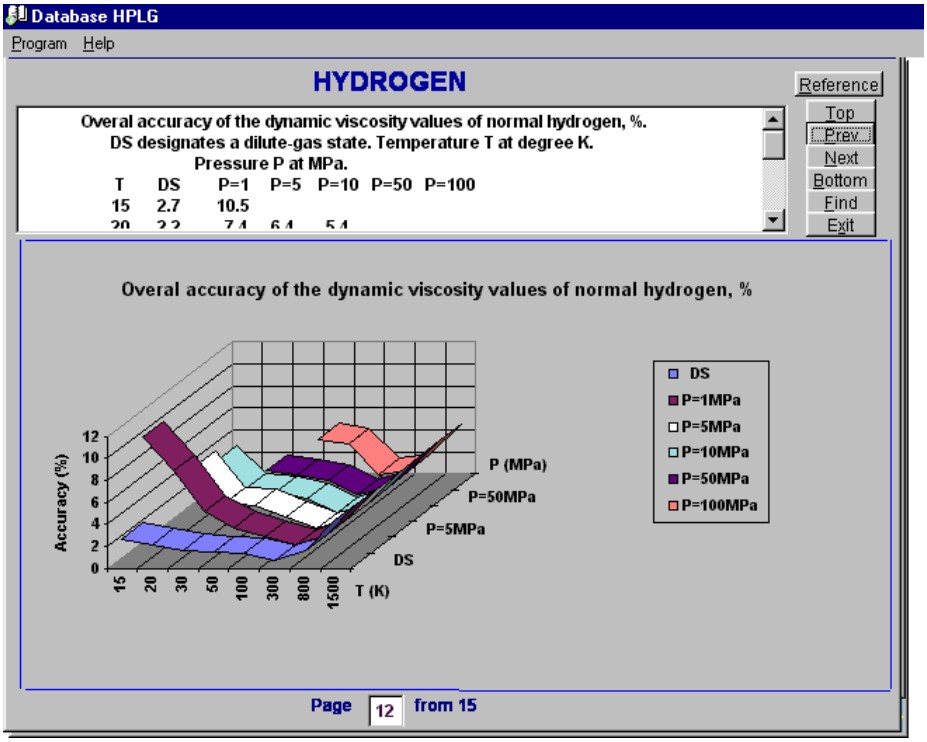

Database HPLG
Temperature Pressure Density Speed_of_sound Viscosity Kinem_viscosity Therm_Cond Therm_Diffusivity Sur_tension
THERMODYNAMIC PROPERTIES OF HYDROGEN AND HYDROGEN COMPOUNDS
HYDROGEN
Browse Reference Units Interpolat
Thermal conductivity of normal hydrogen (La nh, mW/(m.K)) and parahydrogen (La ph, mW/(m.K)) as a function temperature T,K and pressure P, bar. Pressure 0.1 bar designates a dilute-gas state
T = 15.00 P = 0.1 La nh = 12.4
La ph = 12.3
T P La nh
-258.15 0.1 3.0
-256.15 0.1 3.3
-253.15 0.1 3.9
-248.15 0.1 4.9
-243.15 0.1 5.8
-233.15 0.1 7.4
-223.15 0.1 8.9
-213.15 0.1 10.4
-203.15 0.1 11.9
-193.15 0.1 13.3
-173.15 0.1 16.3
Top Prev Next Bottom Find Exit
Viscosity of ionized hydrogen at high temperatures
η
Thermal conductivity of dissociated hydrogen
λ

Fig.3


Database HPLG
Program Help
HYDROGEN
Reference
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Next
Bottom
Find
Exit
Overal accuracy of the dynamic viscosity values of normal hydrogen, %.
DS designates a dilute-gas state. Temperature T at degree K.
Pressure P at MPa.
T DS P=1 P=5 P=10 P=50 P=100
15 2.7 10.5
Overal accuracy of the dynamic viscosity values of normal hydrogen, %
Accuracy (%)
0 2 4 6 8 10 12
15 20 30 50 100 300 800 1500
T (K)
DS
P=5MPa
P=50MPa
P (MPa)
DS
P=1MPa
P=5MPa
P=10MPa
P=50MPa
P=100MPa
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Fig.4.

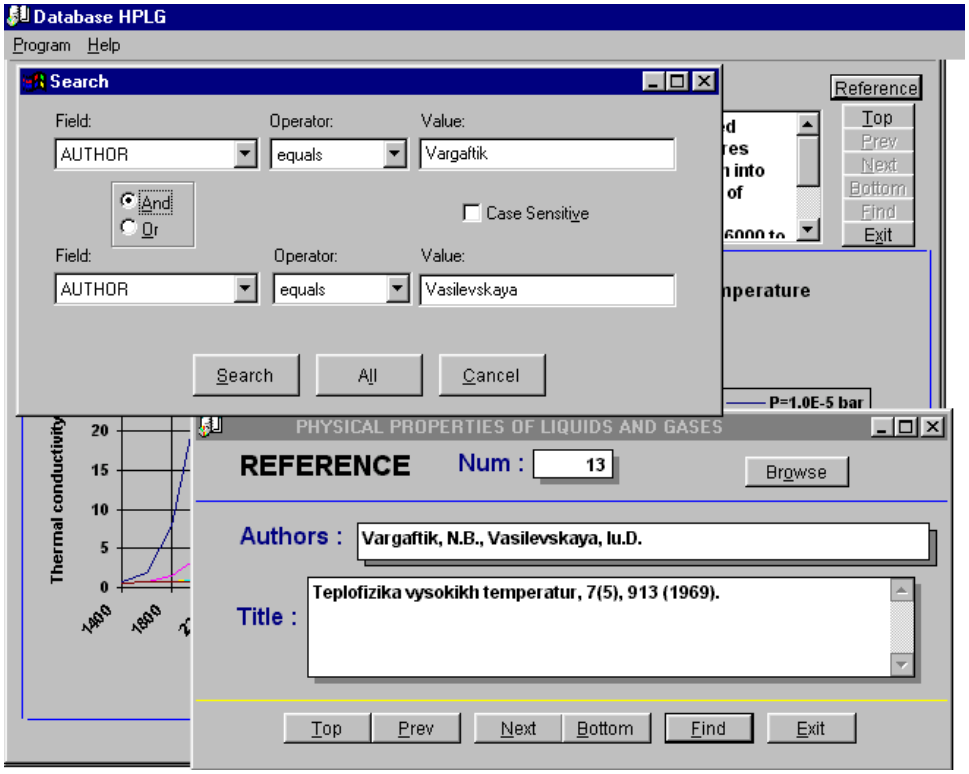
Database HPLG
Program Help
Search
Field:
Operator:
Value:
AUTHOR
equals
Vargaftik
And
Or
Case Sensitive
Field:
Operator:
Value:
AUTHOR
equals
Vasilevskaya
Search
All
Cancel
Reference
Top
Prev
Next
Bottom
Find
Exit
P=1.0E-5 bar
Thermal conductivity
20
15
10
5
0
1400
1800
PHYSICAL PROPERTIES OF LIQUIDS AND GASES
REFERENCE
Num :
13
Browse
Authors :
Vargaftik, N.B., Vasilevskaya, Iu.D.
Title :
Teplofizika vysokikh temperatur, 7(5), 913 (1969).
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Fig.5